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EMBRYOLOGY.[1]

Earthworm Phylogeny.—The great accumulations of anatomical facts that the study of exotic earthworms has brought into existence during the past few years is now to be made more intelligible by the added facts of comparative embryology. It is a fitting tribute to one who has inspired so much of this recent exploration into this field that Bourne's paper[2] upon the development and anatomy of certain Indian earthworms should appear in the complimentary number of Lankester's Quarterly Journal.

When the study of exotic earthworms had shown that there might be large numbers of micro-nephridia present in any segment and when it was even claimed that tubules of these micro-nephridia might anastomose to form a connection from segment to segment, the view of Lankester became less tenable as it became more probable that the ancestral condition of the earthworm was not what the common European earthworm had led one to expect.

It seemed probable that the ancestor of the earthworm might have had a large number of nephridia and of setæ and no definite segmental arrangement of these structures.

Now, however, we learn from Bourne's paper that in the development of *Mahbenus imperatrix* and *Perichœta* the vexatious micro-nephridia arise as out-growths from provisional mega-nephridia and are thus of apparent secondary value. The ancestral condition of a pair of nephridia for each segment being clearly indicated even in these cases. The connection of nephridial tubes, the so-called "plecto-nephric" condition does not, apparently, exist at all, certainly not in the embryo.

We learn also that in these exotic forms, such as Perichæta (which is common with us in green-houses) the large number of setæ found in a band around each segment are not to be regarded as of ancestral value since they all arise from two germ bands that then give rise to matrices which grow laterally in each segment and form the numerous setal sacs by segregation of cells and by division of matrices. The setal germ bands in turn are regarded as probably arising from Wilson's lateral teloblastes.

Besides thus throwing much light upon the probable ancestral condition of seta of nephridia in the earthworm group the author's more detailed future work promises to add to our knowledge of other difficult points, such as the origin of the nerve cord, which it is here stated arises from two distinct matrices.

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[1] Edited by E. A. Andrews, Baliimore, Md., to whom contributions may be sent.

[2] A. G. Bourne. Q. T. Mic. Anat., April, 1894.

Bourne is inclined to regard the germ bands as the source of all the metameric structures. The body wall muscles would be of other origin. The segmentation of the digestive tract a secondary state forced upon it by the mesoblastic structures.

Determination of Sex.—What at first sight appears to be an interesting and valuable addition to the facts tending to show that favorable conditions lead to the production of female offspring and unfavorable conditions to the production of male offspring is to be found in a paper by F. Braem[3] upon the development of a marine polychætous annelid, *Ophryotrocha puerilis.* Here, however, as in some other cases, the evidence is really of little value as may be seen from the facts given by Korschelt in a paper immediately following that of Braem.

Braem found in attempting some regeneration experiments in addition to his study of the ovaries and testes that in one case there was a remarkable change of sex. A female annelid full of ripe eggs was cut into two pieces, the anterior containing 13 and the posterior 22 segments. After three weeks the anterior part had regenerated seven segments.

It had become smaller and appeared to be starving while the eggs had disappeared. When sectioned it was found to have changed its sex, containing only testes. A few cells remained that were ova in process of formation before the sexual glands changed their character and began to form sperms.

The author would refer this transformation into a male to the unfavorable conditions, to the fact that the creature was not sufficiently nourished to form ova as well as to regenerate the lost part of its body.

Now Korschelt in a careful study of the anatomy of this same small annelid finds that besides males and females, there are also hermaphrodites (in fact Braem found one such case) in which the same gland makes both ova and sperms. Among 30 individuals 6 were female, 7 were male, 8 were apparently female but contained male cells both young and full formed, white the remaining 9 were apparently male though containing ova in the testes. Thus the hermaphrodite state is the more frequent one, to judge from these few cases.

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[3] Zeit. f. wiss. Zool., 57.

Though there is no evidence that the male and female states may normally succeed one another in the same animal, yet when this, apparently, was the case in one specimen operated upon by Braem, we are not justified in regarding this is as a result of the operation or as in any way connected with it, since it may be that it would have taken place under the normal conditions. Moreover, and this is more important, the animal full of eggs may very well have been a hermaphrodite from the first, and have merely re-absorbed its ova under the stress of regeneration, so that we know nothing as to any real change from female to male in this case.